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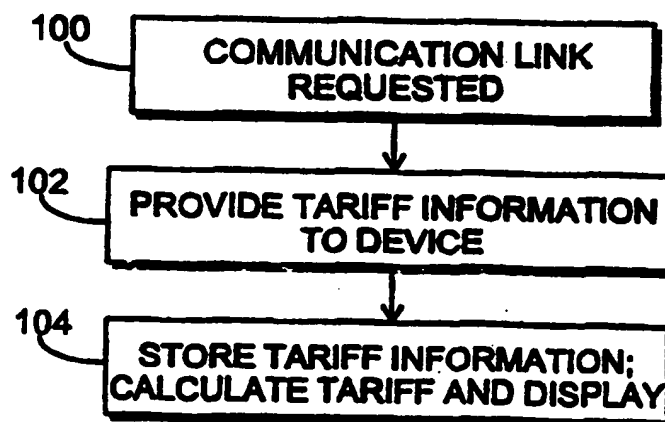
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(54) Title: COMMUNICATION METHOD, SYSTEM, AND DEVICE FOR REDUCING PROCESSOR LOAD AT TARIFF SWITCH

(57) Abstract

A communication device, method and system in which tariff information is provided to a communication device from a control station at call setup, and the charges associated with a call can be calculated and displayed to a device user at the device itself, rather than at a central communication system processor. The tariff information includes the current tariff, future tariff, and time of tariff switch. By providing the tariff information to the communication device, significant signal processing resources at the central communication system processor can be saved.



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COMMUNICATION METHOD, SYSTEM, AND DEVICE FOR REDUCING PROCESSOR LOAD AT TARIFF SWITCH

Field of the Invention

The present invention generally relates to billing or tariff calculation for communication systems. More particularly, the present invention relates to a method, device, and system for determining tariffs while conserving the processing resources of a central communication system processor.

Background of the Invention

It is frequently desirable for a person placing a call over a telecommunication system to be informed of the costs of the call. Thus, many telecommunication systems incorporate charging services which inform a calling party of the tariff. The tariff is typically based on some number of component charging elements, such as: 1) a charge indicator for indicating to a calling party whether that party will be charged for the call; 2) initial start units indicative of service charges to be assessed at the start of the charging period; 3) an initial time period indicative of the time from the start of the charging period until the first periodic increment of service charges; 4) a time period indicative of the time between subsequent increments of service charges; and 5) units per time period (UTP), indicative of the number of charging units (e.g., dollars) to be added periodically to service charges at the expiration of the initial time period and subsequent time periods. From this information, or similar parameters, the total tariff or charge for a call can be calculated.

FIG. 1 is a table showing exemplary tariff charging elements for different calling plans. In this example, subscribers to each plan are assessed a monthly charge (in this example, 7300 yen or 4400 yen), and are also charged for calls according to the rates for various tariff classes (TC = a-f) as expressed in the table. The tariff classes are determined based upon the distance involved in a subscriber's call (e.g., whether the call is within a predetermined local area, some other area within 160 km, or an area greater than 160 km), and upon the particular monthly plan in which the subscriber is

U.S. Patent 5,488,655 to Hamlen discloses a method and system for controlling traffic load by using variable price incentives. Hamlen is similar to Hillis in that a rate is calculated by a central processor, which provides the rate to the user.

U.S. Patent 4,751,728 to Treat discloses a telephone call monitoring, metering and selection device which attaches to a standard telephone. A user pre-programs rate information for multiple telephone service providers (e.g., different long distance companies), which allows the device to determine which service provider will cost the least for a given call. While the device is capable of calculating rates and displaying cost to a user, the device is not an integral part of the telephone. Further, since the rate information is programmed by the user, the device is subject to human error.

U.S. Patent 5,400,395 to Berenato discloses a telephone line selector and accounting system for selecting the lowest-priced long distance carrier and displaying rate information to a user during a phone call. The system automatically calculates rate information based on carrier update tones, and can be connected between several carriers and multiple telephones. The device therefore is not an integral part of the telephone.

All of the above-described systems involve the calculation of rates at a device external to a telephone device, and therefore do not adequately address the problem of reducing processor load upon the occurrence of a tariff switch. It would be desirable for a rate calculation system to reduce this processor load.

Summary of the Invention

The present invention overcomes the above-noted problems, and achieves additional advantages, by providing for a tariff calculation system in which tariff information is provided to a communication system user (i.e., a mobile communication device) at call set-up. By providing the tariff information to a device at call set-up, the user's communication device can perform the tariff calculation, thus reducing the processor load of the central system processor.

communication devices engaged in communication. As discussed above, a tariff switch causes a significant drain on processor resources at the MSC 22.

In accordance with the present invention, when the communication system establishes a communication link between device 10 and base station 20, which may be the result of device 10 initiating a call or receiving a call, tariff information is sent to the device 10, and is stored in processing circuitry 18. This tariff information allows the device 10 to calculate and display to the user of the terminal the charge rate or total tariff. The tariff information preferably includes the current tariff, the future tariff, and the time until the tariff switch will occur. By performing tariff calculations in the communication device 10 rather than the MSC 22, significant processing resources at the MSC 22 can be saved.

FIG. 4 is a flow chart describing a method according to an exemplary embodiment of the present invention. The process begins in step 100, when a communication link involving a communication device 10 is requested. The request can be initiated by the communication device 10 or by another communication device seeking to communicate with communication device 10. In step 102, the MSC 22 provides tariff information, including charging rates for the currently applicable tariff, the next tariff, and the time at which the applicable tariff will switch from the current tariff to the next tariff, to the device 10. Since, in the exemplary tariff schedule shown in FIG. 1, the tariff class includes the current tariff, next tariff, and time of tariff switch, the tariff class can be transmitted to the device 10 as the tariff information. The tariff information is preferably provided at or before call setup (that is, at or before the establishment of the communication link). In step 104, the tariff information is stored in the device 10 (e.g., in processing circuitry 18), and the device 10 calculates and displays tariff information for the subscriber.

A particular example of a call in which the present invention can be implemented will now be described.

The tariff information provided to the device 10 in step 102 includes a current tariff associated with a current time period value (TP1), and a next tariff associated with a next time period value (TP2). The next tariff is the tariff to be used after the

As a result of being provided with this information, the device 10 can determine when 232 time periods have expired, and can change the time period value from 9.0 seconds to 16.0 seconds upon the expiration of the 232 time periods.

5 It will be appreciated that according to the present invention, by sending tariff switch information at call setup instead of waiting until a tariff switch, the central processor load at the tariff switch will be reduced. Furthermore, the present invention avoids the time differential resulting from sending tariff switch information to individual devices, since the information is already in the mobile station.

10 While the foregoing has included many details and specificities, it is to be understood that these are merely for purposes of explanation, and are not to be construed as limitations of the invention. Many modifications will be readily apparent to those of ordinary skill in the art which do not depart from the spirit and scope of the invention, as defined by the following claims and their legal equivalents.

6. The method of claim 4, wherein the tariff information includes a current tariff, a next tariff, and a tariff switch time.

7. A wireless communication device, comprising:

transmitting means for transmitting communication signals to a control station;

5 receiving means for receiving communication signals from the control station;
and

processing means for calculating a tariff for a communication link between the control station and the wireless communication device based on tariff information provided by the control station at the initiation of the communication link.

10 8. The device of claim 7, wherein the tariff information includes a current tariff, a next tariff, and a tariff switch time.

FIG. 2A

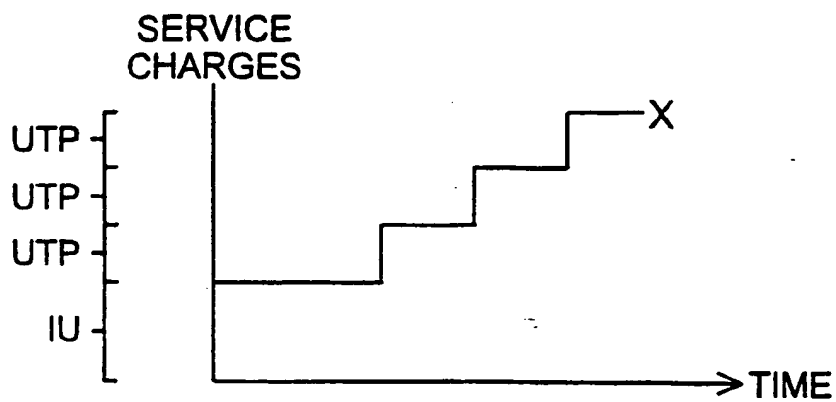
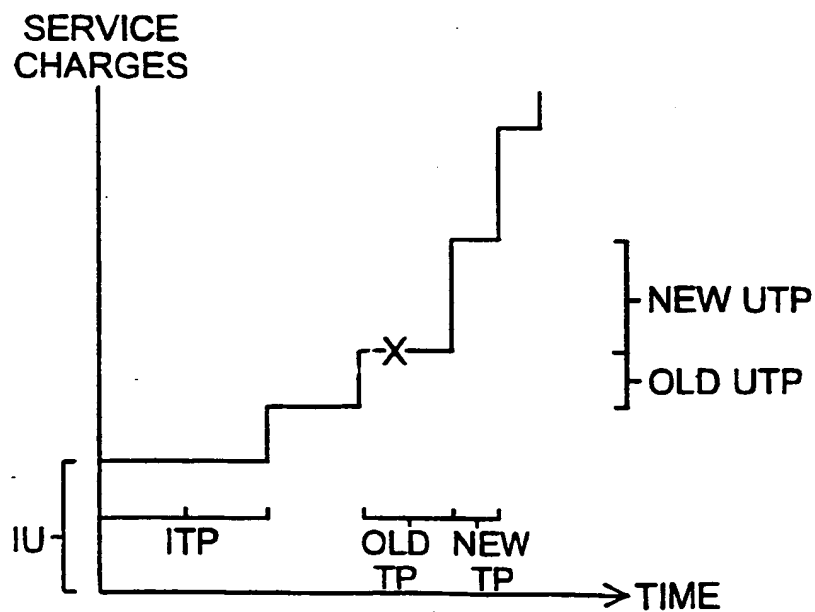


FIG. 2B



INTERNATIONAL SEARCH REPORT

International Application No

PCT/SE 98/00873

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 H04M15/28 H04M15/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 014, no. 451 (E-0984), 27 September 1990 & JP 02 180462 A (TAIKO DENKI SEISAKUSHO:KK;OTHERS: 01), 13 July 1990 see abstract	1-8
X A	EP 0 647 055 A (AT & T CORP) 5 April 1995 see abstract see column 5, line 44 - line 50	1,3-5,7 2,6,8
A	EP 0 734 144 A (SIEMENS AG) 25 September 1996 see column 4, line 19 - line 23	1-8
A	WO 95 20298 A (NOKIA TELECOMMUNICATIONS OY) 27 July 1995 see page 5, line 24 - page 6, line 23	1-8
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

7 October 1998

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19/10/1998

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INTERNATIONAL SEARCH REPORT

information on patent family members

Int'l Application No

PCT/SE 98/00873

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